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PRINCIPLES OF STOCKFEEDING.—II.

HOW THE ANIMAL USES ITS FEED.

BY CUTHBERT POTTS, B.A., Principal, Queensland Agricultural College.

[*In the first article of this series, published in the December issue of the Journal, Mr. Potts described the constituents of stock feed and some of the fruits of the experience, ripened by the simple process of trial and error, of stock-raisers in older countries. In this and succeeding articles it is not proposed to go deeply into the science of feeding, but, rather, to employ the results of scientific research in an effort to show how stockfeeding may be made more profitable.*]

Having briefly examined the composition of feeds, and having indicated the special part played by each class of food-ingredient, it is necessary next to study somewhat in detail the uses to which an animal puts its food.

Perhaps we can arrive at a quicker and better understanding of this matter if, first, we put it down in table form and then proceed to describe each item of the table, thus:—

THE FOOD EATEN BY AN ANIMAL IS USED

(1) For maintaining life.	(2) For carrying out the process of digestion.	(3) For production.

Perhaps in actual practice there is no very clear line of division between these three sections. They overlap somewhat, and, generally, any feed eaten is used in the three ways. Still, the division is convenient. It is real, and a clear conception of each of these three uses for the feed is a sound foundation upon which to build up a proper system of profitable stockfeeding. Let us consider each section in detail.

(1.) *For Maintaining Life.*—If we consider a fully grown animal, say a bullock, and endeavour to keep him just as he is, in good, healthy condition, but neither gaining nor losing weight, nor doing any work, but just living, we would find it necessary to give him each day a certain amount of feed, taking into consideration both quantity and quality (*see* Principles of Stockfeeding—I.). This daily feed would be consumed, but the animal would show no response to it. He would be to-morrow just as he is to-day, or was yesterday. Without this feed he would waste away and eventually die. With this feed he is maintained as he is. Hence we know this as a "maintenance diet." If less than the maintenance diet is fed, the animal is on starvation rations and must of necessity fall away in condition. If more than the maintenance diet is fed, the animal can produce, as will be described later.

Just here there are several points which are of importance to note. First, we have the case of the young stock. From the very nature of things, young stock try to grow. To feed them a mere "maintenance diet" is not possible. Whatever feed they get, they try to convert some of it into increased body tissue and bone. If the feed is not sufficient in quantity and quality for both maintenance and growth, then neither function is carried out properly. In brief, the young animal becomes starved and stunted. If the shortage of feed is prolonged, the youngster gets a set-back from which it never recovers, while if too prolonged the youngster dies; and we know that young animals will die under conditions of feed which will keep mature animals alive and healthy.

Much the same can be said with regard to cows in milk. Here we have a female endeavouring to produce food for her young. Because of man's careful selection and breeding, however, the dairy cow can produce, and tries to produce, much more milk than is just sufficient to nourish her calf. Here, again, it is not possible to feed a mere maintenance diet. For, whatever feed is given to a cow in milk, some portion of it will be used to make milk, and the better the cow the greater the tendency for her to so use her feed. On a maintenance diet which would keep a bullock in idleness and in good condition, a milking cow would starve to death. How often we see good milch cows lean in condition! They may put on fat when nearly dried off. Further, under drought conditions the best cows are likely to die first.

There is yet a third point which might be mentioned here, though we shall have more to say about it later on. A maintenance diet merely keeps stock as they are. We naturally may ask the question: "Is it profitable to feed a mere maintenance diet?" Let us examine several cases. You might have a number of prime bullocks fit just at a time when the market temporarily is against you. Here it might well pay to feed a maintenance diet, merely for the purpose of holding the bullocks as they are. On the other hand, if you have stock which you have let get into low condition, say, because of drought, and then you begin to feed a maintenance diet in order to keep them alive, it certainly does not pay directly, though it may pay indirectly by holding your stock against the chance of favourable seasons. A little thought, however, will indicate that you may easily expend on feed for such impoverished stock an amount well in excess of their value, and at the end have the stock in the same starved condition as when you began.

With young stock and cows in milk, as has been pointed out, the feeding of a mere maintenance diet does not pay. In truth, with milch cows, the heavier the feeding, within the powers of the cow to produce, the cheaper the feeding. To put it crudely: Suppose it takes 15 lb. of feed for maintenance and each extra pound of feed will enable the cow to produce 3 lb. of milk, then we have the following:—

15 lb. of feed	..	animal kept alive and healthy; no milk
16 lb. of feed	..	animal kept alive and healthy; 3 lb. milk
17 lb. of feed	..	animal kept alive and healthy; 6 lb. milk
18 lb. of feed	..	animal kept alive and healthy; 9 lb. milk
25 lb. of feed	..	animal kept alive and healthy; 30 lb. milk

and it is quite within reason to anticipate that the 30 lb. of milk would more than pay for the 25 lb. of feed given; whereas, with no milk, the 15 lb. of feed is a dead loss.

Thus we see that in this matter of stockfeeding we must consider a portion of the food as being used merely to maintain life. Any feed in excess of this can be used for production. Again, it is quite just to consider the maintenance diet as giving no returns—as being a loss; while any excess feed, because it enables the animal to produce something, does give returns, and possibly profitable returns. In this we have something very similar to the efficiency of a machine. All the energy put into a machine does not come out as useful work. Part of the energy put in is used up in overcoming friction, and is generally referred to as lost energy. We have some considerable control over the amount of energy which may be lost in a machine. By careless oiling, bad adjustments, &c., we can easily increase the loss greatly, but with the greatest of care we cannot reduce the loss below a fairly definite quantity (about 40 per cent.). Is it the same with stockfeeding? Can we exercise any control over the amount of feed required for maintenance? Let us see.

We all know that animals maintain their bodies at some fairly definite temperature; for example, it is 98.4 deg. F. in the case of human beings, 101 deg. F. for cattle, 100 deg. F. for horses, 103 deg. F. for pigs, 107 deg. F. for poultry, &c. To maintain this temperature the animal has to generate an amount of heat inside its body. It does this by oxidising (burning) a portion of its feed as this is being conveyed throughout the body in the blood stream. This generation of body-heat is a normal function of animal life. A portion of the feed must be used for this purpose. Heat is generated and given off by the animal, whether the outside temperature is higher or lower than that of its body. But (and herein lies the important

point for us at this stage of our discussion) more heat, and therefore more of the feed, is required to keep up the body temperature if the stock are exposed to cold, wet, bleak conditions than is the case if they are well housed, or rugged, or well sheltered by trees, say, in the paddocks.

Again, animals are creatures of movement. They move themselves from place to place in search of food and water. They move their jaws in the process of feeding. They swish a tail or shake their skins to rid themselves of flies or other pests. They flicker an eyelid. In short, movement, whether deliberate or involuntary, is a normal state with animals. If they are "at rest," that is, not doing work, then these movements are for maintaining life. But as movement cannot take place without energy to force it, and as the energy in an animal is derived from its feed, so a certain amount of the feed eaten is utilised for the generation of the energy required for what might be called "maintenance movements." Obviously man can have a large control over much of this maintenance movement. If the stock have easy access to both feed and water, so that long travel from one to the other is avoided, movement in search of food can be reduced. In the same way, if the animals are kept under comfortable conditions—conditions which do not cause the beast to wander round aimlessly all night in search of shelter or all day in search of shade, or conditions which largely prevent the irritation by flies or mosquitoes or ticks or other irritants (there is a lot of truth in the phrase "to be worried to death," or, at any rate, to leanness)—then much energy, and consequently much maintenance feed, is saved. It must be remembered, however, that a certain amount of exercise is necessary for healthy life and development. Even when topping up a pig, exercise must not be prevented entirely.

There is yet a third demand for maintenance. We often say that a young animal grows; that it ceases to grow when mature; and that it declines or wastes away with age. This statement is not correct. Growth is a normal function of life, and continues until death. So is the wastage or decline. In young animals the tendency to grow exceeds the tendency to waste; so the animal increases in size and bulk. At maturity, growth and wastage balance one another as regards the actual animal body, though the animal can produce and the energy required for this production can be made good by extra feed. In old age, wastage exceeds the tendency to grow, and so there is a decline. Now this ever-present wastage—wastage of tissue, we term it—requires to be made good. It is a matter of maintenance, and a certain quantity, chiefly of protein matter, is required in the maintenance diet. We cannot exercise any great control over the amount of proteins required to repair the wastage necessary for maintenance.

Thus we see that an animal which is merely living, but neither working nor producing, required an amount of feed for maintenance which will supply:

(1.) Heat, to keep up body temperature;
(2.) Energy, to allow of necessary muscular action;
(3.) Proteins, to repair wastage of tissue.

Careful management can exercise considerable control over the first two, but not much over the third. Carbohydrates, fibre, and fats are chiefly concerned in supplying heat and energy, while the proteins of the feed (Stockfeeding—I.) are mainly responsible for repair of tissue. The discussion as to actual quantities must be deferred to a later article.

(2.) *For Carrying Out the Process of Digestion.*—Referring to our table at the commencement of this article, it will be seen that we have spent considerable space on the discussion of the "maintenance diet." This has been done because it is considered essential that a clear conception of what is meant by maintenance should be got before any idea of profitable feeding—that is, feeding for production—can be established. However, before we approach the production side of feeding, with its probability of profits, it is necessary to consider a subsection—namely, the feed required for the process of digestion.

In this discussion it is not necessary to go into the question of digestion in detail. All that is required is that you should understand one or two points. First.—A certain amount of muscular action is required to break the feed up into small particles and to pass it through the system. Second.—The feed, as it passes into the mouth, and thence to the stomach and on through the intestines, is flooded with various digestive juices. Just consider food as it goes into the mouth. It is chewed, ground up by the teeth, and at the same time it is wetted with saliva. A somewhat similar action takes place at each stage of the food's passage through the animal's system—that is, a certain amount of the feed has to be expended to generate the energy and create the gastric juices required for digestion. Here, again, we have a loss in feed-value. But it is a loss which cannot be eliminated. It can, however, be reduced to a minimum with careful management.

Thus, feeds which contain a large amount of indigestible fibre require more energy for digestion than feeds which are more highly concentrated. For example, hard, dry straw makes a bigger demand for digestive energy than bran, or grain, or green lucerne.

Again, an animal wastes much digestive energy if it becomes over-tired or exhausted. An animal suffering from fatigue does not assimilate its food easily.

But, perhaps, the main point to be considered with regard to this use of the feed is that of "vitamines." This introduces a new feature into our discussion. It can be treated only very briefly here. The term "vitamine" has been applied to certain chemical compounds which are present to greater or less extent in various feeds, but, even so, are present in very small quantities. The function of these vitamines is to make the feed ingredients more readily digestible. In practical feeding we can meet this requirement by using mixed feeds. Thus we find that a feed composed of a single crop—*e.g.*, a feed made up of maize silage, maize stover, and maize meal—is not so satisfactory as one composed of maize silage, oaten chaff, bran, and linseed meal, even though the analysis shows each feed mixture to contain the same quantities of digestible ingredients. In short, by mixing different crop products we are almost certain to bring in the necessary vitamines.

(3.) *For Production.*—This is the third use to which the animal puts its food. It is the important use as regards possible profits. Let us first summarise the different types of production:—

(*a*) An animal may be required to produce mechanical energy—*i.e.*, it is used for draught purposes or riding.

(*b*) An animal may be required to produce, merely by putting on fat, as when we are topping-up a pig for market.

(*c*) Another form of production is that of growth. This may be growth of body tissue, as with young animals, or it may be growth of wool. Included with this might be the production of milk.

(*d*) Still another form of production is the reproduction of the race. It is obvious that the female, when carrying the fœtus in the womb, is producing something. It is not so obvious, but it is nevertheless true, that the male is expending much energy when used at the stud.

All these various forms of production require a modification of the feed given, but all of them require feed in excess of the maintenance diet. This will be treated later.

Let me just finish this article by pointing out to you that the feed required for maintenance is a fairly constant quantity—that is, for any given breed or species, equal live weights require the same amount of feed (quantity and quality) to maintain themselves. If feed in excess of this is given, the animal can produce, but individual animals vary greatly in their power to produce. Some are efficient, and pay to feed. Others are inefficient, and are not payable.

Perhaps we can illustrate this best by considering a number of dairy cows. Suppose each cow weighed 1,000 lb. live weight, but that different cows varied in their power of milk production from 20 lb. per day up to 80 lb. per day. Further, suppose each beast fed to the limit of its production. To begin with, each cow would be debited with an equal amount for maintenance. Beyond this, each animal would have to be debited with its production feed. The least consideration (*see* table, p. 60) will show that the worst cow, the producer of 20 lb. of milk, has no chance to pick up her debit for maintenance. On the other hand, the best animal, the producer of 80 lb. of milk, may—in fact, will—pay to feed.

This leaves us, then, with one of the big fundamental facts of feeding: *It does not pay to feed indifferent producers. It does pay to feed high-class stock.*

DAIRY FODDER PLOTS.

By C. S. CLYDESDALE, Assistant Instructor in Agriculture.

The majority of farmers engaged in dairying do not appear to realise the advantages to be gained by the growing of crops to supplement pastures to tide their stock over the leaner months of the year.

With the object of introducing the system throughout the Northern, Central, and Southern coastal districts, where reliance is usually placed on Paspalum, Rhodes, and other grasses, certain crop trials were instituted by the Department of Agriculture and Stock to determine the best single crops or crop mixtures for the purpose, and to demonstrate also that the methods, as practised, are not out of reach or too elaborate for the dairy farmer to undertake.

In Southern Queensland the undermentioned farmers co-operated in carrying out trials with Dairy Fodder Plots during the past season:—A. Hulse, Yandina, North Coast line; F. C. Burton, Bridges, North Coast line; and J. B. Stephens, Nindooimban Estate, Beaudesert.

The soil on Mr. Hulse's farm is a deep, alluvial type of dark-grey loam, fairly rich in humus, which has been under crop, principally maize, for several years. That on Mr. Burton's farm is a deep, light-red coloured, sandy loam, which has been under sugar-cane for a number of years, and, consequently, somewhat deficient in available plant food. Mr. Stephens's property is composed of rich, black, alluvial soil, situated on the banks of the Albert River, and is practically new ground, having produced only two crops, subsequent to which it was fallowed during the Summer months.

No fertilisers were used on this occasion on any of the plots.

The rainfall recorded at Yandina Railway Station, which is ¾ mile from Mr. Hulse's, and 3 miles from Mr. Burton's property, was—

Month.	Points.	No. of Wet Days.
March	1,059	9
April	1,110	10
May	357	5
June	716	11
July	643	6
August	183	1
September	172	5

The rainfall for Beaudesert was—

Month.	Points.	No. of Wet Days.
March	487	13
April	453	13
May	213	11
June	792	9
July	652	6
August	31	2
September	205	12

Cultivation.—At Yandina the land occupied by plots was ploughed late in February, to a depth of 8 in., immediately after the removal of a crop of maize (grain), but turned up in a very rough condition; and, later on, in March was cross-ploughed and, prior to planting, was reduced to a fine tilth by means of the disc-cultivator, followed by the harrows.

At Bridges the land was ploughed and harrowed in March, and cross-ploughed and harrowed in May; these operations resulted in an excellent seed-bed.

The plot at Nindooimbah was fallowed during the Summer, and before planting was again ploughed, thus making a perfect seed-bed.

Sowing.—The heavy rain experienced in March and April delayed planting operations. The soil was not dry enough to plant until 16th May, which, under the circumstances, was rather too late to expect early supplies of Winter fodder.

At all plots the usual local practice of broadcast sowing was followed, seed drills being unavailable. When used in mixtures, peas and vetches were sown first and "disced" in, the cereals being sown on the disced surface—once harrowed, and then rolled.

The majority of the plots made rapid progress, particularly the early maturing varieties.

Description and Varieties on North Coast.—The two varieties of wheat experimented with—"Prince" and "Patriot"—appear to be suitable for the coastal districts, being practically free from rust, and made excellent growth. When harvested, they averaged 5 ft. in height.

Ruakura and Algerian oats suffered considerable damage owing to excessively wet weather, causing them to lodge, and to be badly affected by rust. They reached a height of 3 ft. at time of harvesting.

Skinless barley suffered badly from the effects of rust, which appeared when the crops were 2 ft. high, in the "shot blade" stage.

Cape barley did fairly well, and when harvested averaged 4 ft. in height, producing a large amount of foliage, and showing only slight indications of rust.

Rye made quick growth, looked remarkably well throughout the growing season, and, when harvested, averaged 5 ft. in height.

In all plots the field peas did remarkably well, making vigorous growth throughout, and, when harvested, averaged 4 ft. 6 in. in height.

Vetches, which are usually rather slow in growth, produced a fair amount of foliage, and, when harvested, averaged 4 ft. in height.

PLATE 20.—PRINCE WHEAT AND VETCHES AT MR. A. HULSE'S FARM, YANDINA.

PLATE 21.—PRINCE WHEAT AND VETCHES AT MR. F. E. BURTON'S FARM, BRIDGES, N. C. LINE.

Plots at Nindooimbah.—Throughout the plots, peas and vetches were considerably overgrown by the other cereals used, thus affecting the subsequent yields of fodder. The varieties of wheat—"Prince" and "Patriot"—made excellent growth, stooling well, and having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

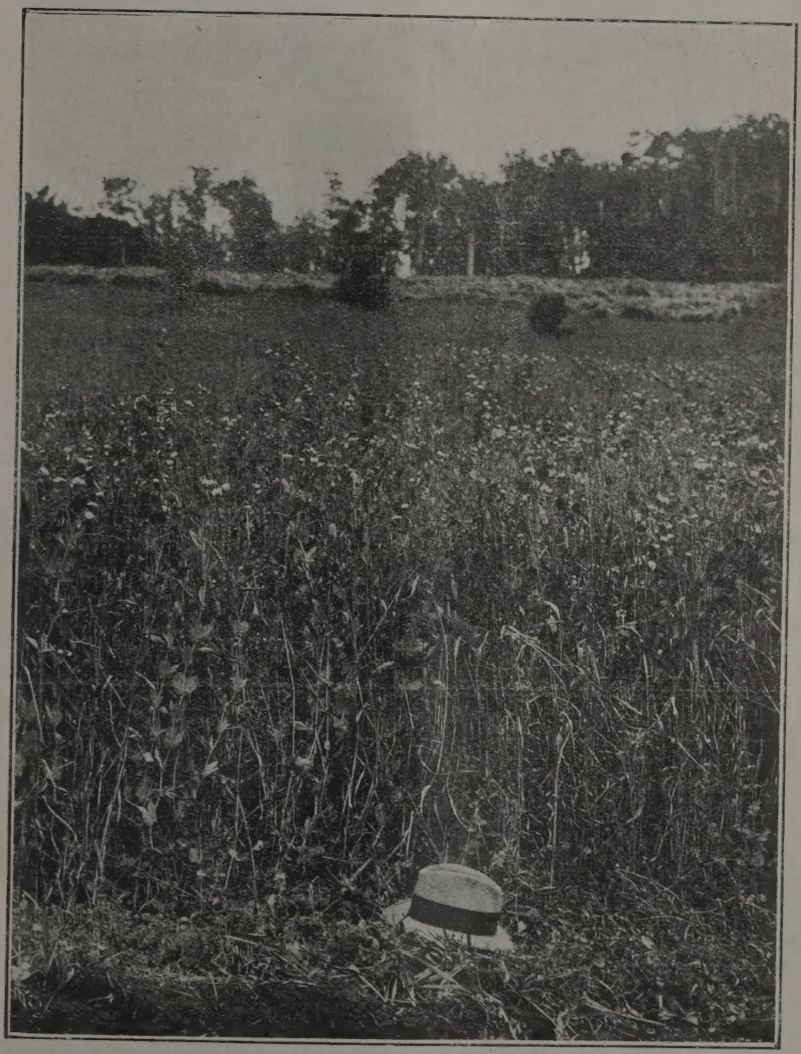


PLATE 22.—PATRIOT WHEAT AND FIELD PEAS AT MR. F. E. BURTON'S FARM BRIDGES, N. C. LINE.

Skinless and Cape Barley.—During the early stages of growth, these varieties suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape Barley made most remarkable growth, but that of "skinless," subsequent to the first cutting, was somewhat thin.

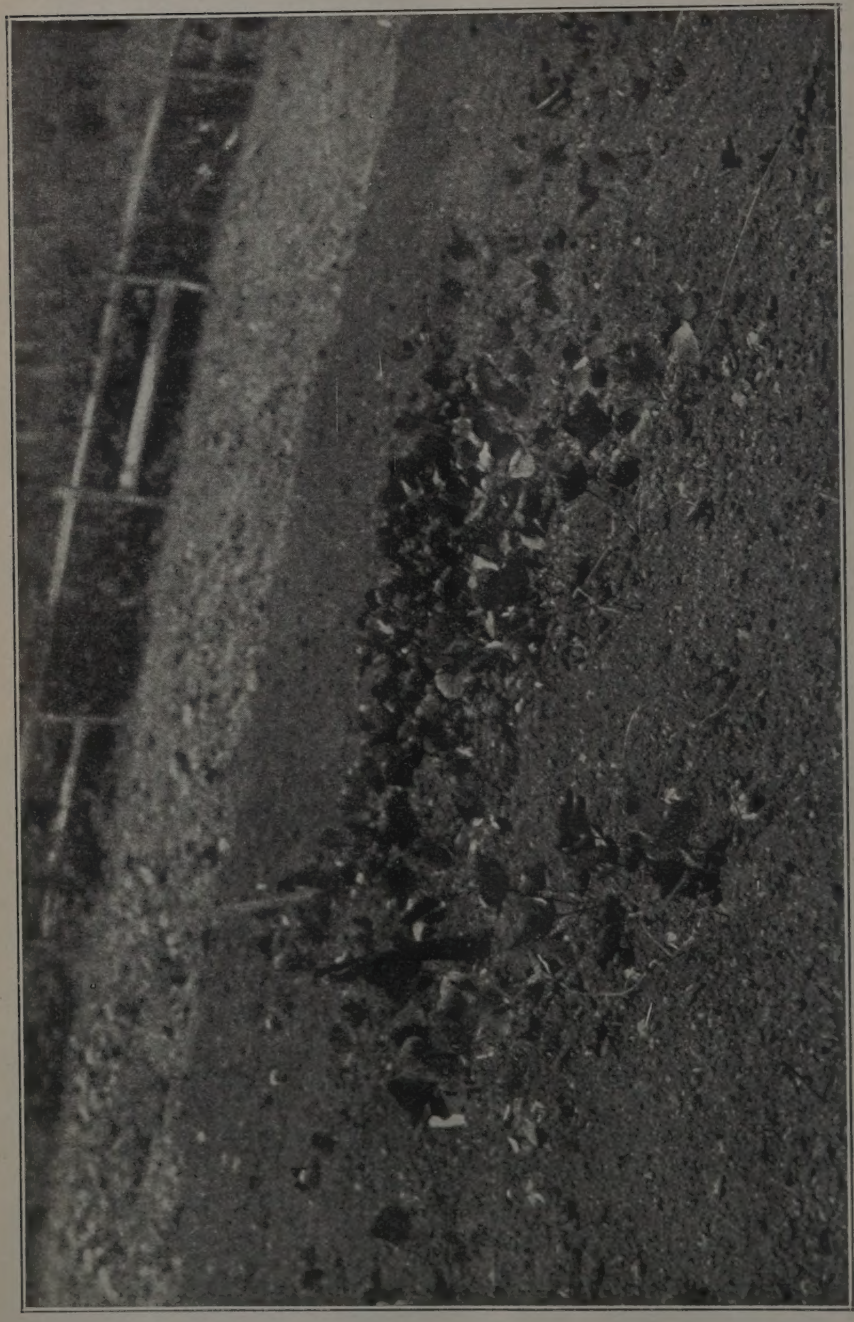


PLATE 23.—KUDZU VINE (FODDER PLANT), AT MR. H. M. MCMARTIN'S FARM, PULLEN VALE.

Ruakura and Algerian Oats.—The former, being much the earlier of the two varieties, stooled well, and resulted in a much heavier growth. Later on, however, it showed an inclination to lodge, and to rust. The Algerian oats were somewhat later in maturing, but stooled well; this crop also showed an inclination to lodge, and a susceptibility to rust.

Rye.—Owing to its early maturing habits and favourable conditions, the rye made rapid growth, and was harvested on 13th August, averaging 5 ft. in height at the time.

By using a little judgment in selecting the right varieties to grow, and getting the first sowing in, say, towards the end of March or April, a plentiful supply of green fodder should be available from early August until practically the end of October, by which time the Spring growth in pastures should be well advanced.

In all plots, each of which contained one-tenth of an acre—

Wheat was sown at the rate of 60 lb. per acre.
Barley was sown at the rate of 50 lb. per acre.
Oats was sown at the rate of 40 lb. per acre.
Rye was sown at the rate of 60 lb. per acre.
Field peas was sown at the rate of 30 lb. per acre.
Vetches was sown at the rate of 20 lb. per acre.

RESULTS.

Varieties.	YIELDS PER ACRE OF GREEN FODDER.											
	A. Hulse, Yandina.				F. G. Burton, Bridges.				J. B. Stephens, Nindoombah.			
	T.	C.	Q.	LB.	T.	C.	Q.	LB.	T.	C.	Q.	LB.
Prince wheat and peas	16	16	2	12	2	14	0	2	13	10	0	10
Prince wheat and vetches	10	16	0	8	6	1	2	4	11	17	2	20
Patriot wheat and peas	16	4	0	12	9	2	0	0	14	0	3	16
Patriot wheat and vetches	11	6	3	4	2	0	2	1	12	18	1	26
Rye and peas	10	16	0	8	5	5	1	9	14	11	2	22
Rye and vetches	7	11	1	0	Destroyed by wallabies				16	4	0	22
Cape barley and peas	12	3	0	9	10	16	0	8	13 (two cuttings)	10	0	10
Cape barley and vetches	7	11	1	0	2	19	1	19	15	2	2	0
Skinless barley and peas	11	6	3	14	Destroyed by wallabies				5	18	3	10
Skinless barley and vetches	5	13	1	21	Destroyed by wallabies				5	2	2	15
Ruakura oats and peas	9	9	0	7	4	3	2	25	18	18	0	14
Ruakura oats and vetches	7	11	1	0	Destroyed by wallabies				17	16	2	2
Algerian oats and peas	8	18	1	1	3	6	0	19	9	3	2	18
Algerian oats and vetches	6	15	0	5	Destroyed by wallabies				9	14	1	24

The yields generally on Mr. F. G. Burton's plots were reduced by the depredations of wallabies.

RUSSELL RIVER GRASS.

C.W.L.B. (Atherton) writes:—

"*Re* an article in December issue on Russell River Grass. When I was on a farm up here (Atherton) I had a lot of it on my place, and used to curse it pretty heartily on account of the speed with which it covered the ground. It is a fairly useful feed, especially as a change of diet, just after a grass fire while it is young and sweet, but it soon becomes frightfully coarse, almost like a sort of cane (on a very small scale, that is), and stock will not look at it. I think, however, that it will repay careful examination, for this reason:—I had a mob of poor horses in a paddock of it, and the beggars never seemed to be feeding, yet they were putting on condition. So I put in a Sunday watching them. They did not touch the "flag" at all, but put in the whole time painfully nipping off the full-grown seed-heads. As they soon got rolling fat, I judge that these seeds, which are small and round, something like rape, should contain some oil of a high food value. As the grass is a very prolific seed bearer, something might be done in the way of preserving the seed and feeding it in a balanced ration. One never knows. Another thing: the grass will never become a permanent pest in ploughable land, as one turning over settles it."

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

POINCIANA REGIA.

NATURAL ORDER LEGUMINOSÆ (Pulse or Pea family).

BY E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—(B.M.T. 2884, 1841) *Poinciana* (in honour of H. de Poinci, Governor of the Antilles in the middle of the seventeenth century, and a patron of Botany); *regia*, royal, Royal Peacock Flower. This magnificent tree was discovered near Foule Point, Madagascar, by M. Bojer, Professor of Botany at the Royal College of St. Louis, Mauritius, who in the course of a visit to Madagascar discovered and named both *Poinciana regia* and *Colvillea racemosa*.

Description.—A beautiful tree from 30 to 40 ft. high, having an erect trunk covered with a grey, smooth bark; branches spreading, somewhat pendulous at ends, particularly with new growth (this latter including stems); are bright green, the whole forming a beautiful symmetrical head.

Leaves.—Broadly ovate in contour, up to 2 ft. long, abruptly bipinnate, with from 11 to 24 pairs of pinnæ, that are from 2 to 5 in. long; leaflets oblong, blunt at each extremity, upon very short petioles, paler beneath, and one-nerved, in from 16 to 30 pairs about ¼ in. long. Common petiole (stem) grooved above, inserted upon a remarkably swollen fleshy base. The new leaves are of a very delicate bright green, darkening with age to a deeper tint. Stipules abruptly bipinnated, erect, not unlike small false leaves; they are deciduous, and only appear on the new growth.

Flowers.—Bright scarlet, in loose racemes, terminal, and from the axils of the upper leaves; petals five, almost orbicular, spreading, reflexed, tapering into long claws, veined on the upper side, and dashed with faint yellow lines above the base; upper petal more cuneate, crinkled at edge, variegated, and striated with red and yellow. Stamens ten, shorter than the petals, filaments red, anthers oblong, two-celled, style terminated by an obtuse stigma, green at base, about the same length as stamens, the complete flower when fully opened being about 5 in. across.

Pod.—Two-valved, of a rather woody texture, from 10 to 24 in. in length, 2 to 2½ in. broad, terminated by the persistent style. Seeds about ¾ in. in length, compressed, ash coloured, streaked with brown, and a very hard outer skin.

Propagation.—From seed. When sown fresh they germinate freely, notwithstanding the hard outer covering. It is a good plan to sow in well-drained boxes, covering the seeds with about an inch of sand; keep well watered and out in the full sunshine. The heat helps to germinate the seed quickly. It does not thrive really well in pots after the first season. The young plants are apt to become stunted, but if grown in the open ground a rapid growth can be looked for; being deciduous, they transplant well at end of winter. Old trees flower very well; it usually takes about ten years in the Brisbane district before they commence to produce flowers. Trees that flower well and produce a large crop of seed pods do not, as a rule, flower well the following season, but those that flower and do not seed bear a profusion of flowers each season.

This magnificent tree is widely cultivated throughout the tropical world, its gorgeous flowers making it a universal favourite. In India it is known as the "Flame of the Woods." In the Hawaiian Islands, where it has been largely planted, J. F. Rock, in his "Leguminous Plants of Hawaii," alludes to its strong root system, saying "not even the severest storms these islands experienced in December, 1918, uprooted a single tree of this species." In many places it is known as the "Flamboyan."

In Brisbane the *Poinciana regia* flowers in December and January. There are four fine specimens, and a number of newly planted ones, in the Botanic Gardens. A particularly fine tree that always flowers profusely is growing at Bowen Park, a smaller but a very fine specimen in the Museum Gardens, and numerous others in many private gardens, but room should be found for many more of this, probably the best of all flowering trees.

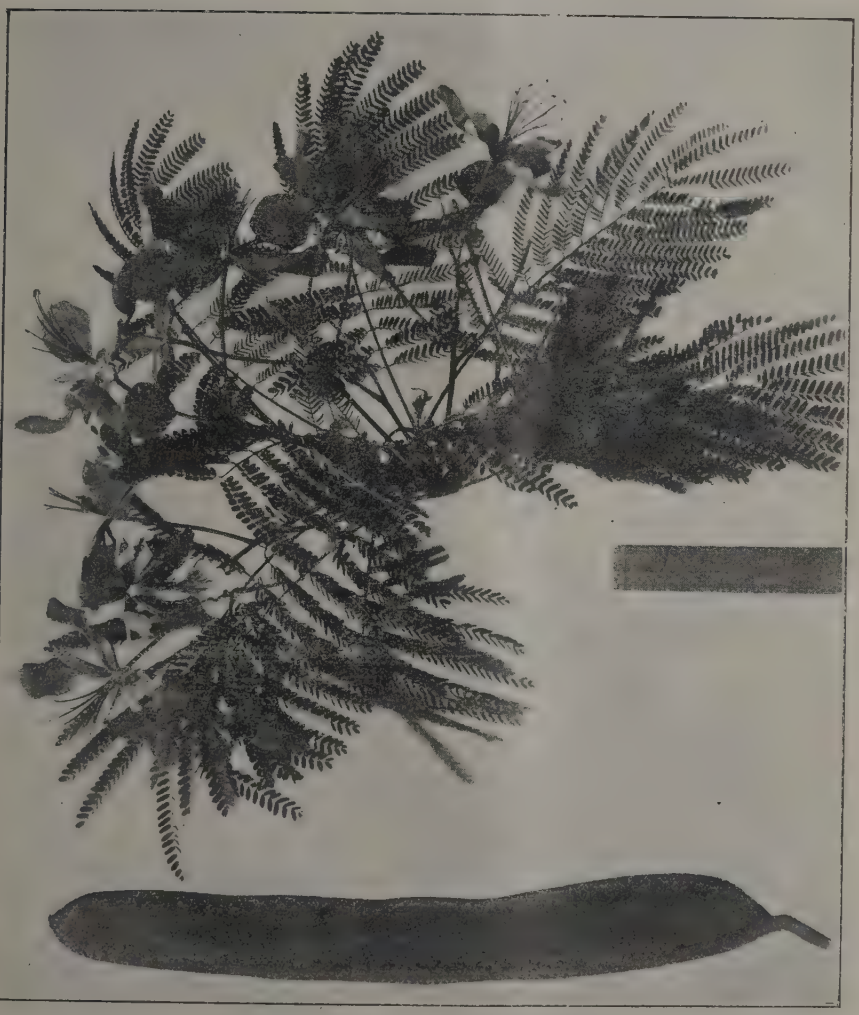


Plate 24.—Poinciana Regia.
A.—Seed pod. B.—Flower stem.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, Government Botanist.

No. 26.

WILD SALVIA (*Salvia coccinea*).

Description.—A strong-smelling undershrub of 2 to 3 ft. Stems quadrangular, downy, often with a purplish tinge. Leaves ovate or triangular ovate, 1 to 2 in. long, on a petiole (leaf-stalk) of 1 to 1½ in.; under-surface slightly wrinkled and clothed with white hairs; the edges toothed with rounded teeth. Flowers scarlet (rarely pink or pure white), borne in whorls along a slender spike, each whorl of flowers subtended by two green bracts; each individual flower is on a pedicel (stalklet) of about ¼ in. Calyx dark-green or tinged with purple, prominently ribbed, about 5 lines long. Nutlets (''seeds'') light brown, ellipsoid, about 1 line long, situated at the bottom of the calyx tube.

Distribution.—A native of the warmer parts of North and South America; naturalised in most of the subtropical or warmer parts of the globe.

Botanical Name.—*Salvia*, from Latin *salvo*, I save, on account of the use of several species of the genus as healing and curative herbs; *coccinea*, Latin, of a scarlet colour.

Common Name.—Commonly known as ''Wild Salvia'' on account of its similarity on a small scale to the common garden plant *Salvia splendens*.

Properties.—This plant has been introduced into most warm countries as a garden plant. So far as I know, it does not possess any economic value.

Some years ago it was reported from the Beenleigh district, south-eastern Queensland, as a weed believed to be causing abortion in cows. I had not further heard of the matter until Mr. W. Greenwood, of Lautoka, Fiji, supplied me with the following note:—''In the Proceedings of the Hawaiian Entomological Society, in Vol. I., page 1179, the following account of the plant occurs under a description of a trip to one of the smaller Hawaiian Islands: 'At about 1,500 ft. elevation the introduced red-flowered salvia (*S. coccinea*) was growing wild; this was probably an escape from gardens, and which, if not eradicated, will become a pest (if it is not one already), as it is known to produce abortion in cattle.' '' Mr. Greenwood goes on to say that the plant is a common weed in parts of Fiji, but he has heard of no harmful properties being attributed to it by cattlemen there.

The reports, however, of the plants causing abortion in cattle from two widely separated sources is remarkable. An allied plant *Mentha saturcoides* (the ''native pennyroyal''), a common weed in Queensland, was recently brought to me as being illegally used as an abortifacient, and the use of the common pennyroyal (*Mentha pulegium*) in this capacity is well known.

Eradication.—So far as observed in Queensland, the ''wild salvia'' is not a particularly aggresive weed, and calls for no special method of eradication.

Botanical reference.—*Salvia coccinea* Juss. ex. Murr. in Comm. Gotting. I. (1778), 86, tab. I.

THE DAIRY PRODUCE ACT.

Vendors of butter, cheese, and condensed milk are now directed to register under ''*The Dairy Produce Act of* 1920.'' Forms of application may be obtained from the local dairy inspector or the nearest clerk of petty sessions, and the application for registration, together with the prescribed fee of 2s. 6d., should be posted direct to the Department of Agriculture and Stock, Brisbane. Owners of cream depôts, butter, cheese, and condensed milk factories, butter and milk carts, farm produce agents, and vendors of fertilizers and margarine are reminded that they must immediately register licenses for the year 1922 with the Department of Agriculture and Stock.

PLATE 25.—WILD SALVIA (*Salvia coccinea*).

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 8.

OPOSSUM WOOD (*Quintinia Sieberi*).

Common Name.—Opossum Wood (may originate from the peculiar wrinkles of the bark, which might have been attributed by bushmen to the scars left by the claws of opossums; the peculiar markings of the bark, which are a natural feature of it, resemble the scars left by opossums' claws).

Derivation.—*Quintinia*, in memory of La Quintinie, a French botanist; *Sieberi*, after F. W. Sieber, a botanical collector, of Prague, Bohemia, who spent seven months in collecting plants in New South Wales in 1823 (J. H. Maiden).

Description.—A tree attaining a height of 70 ft. and a barrel diameter of 2 ft. Barrel not prominently flanged at base. Bark dark brown, sometimes almost black, often wrinkled and with a row of scales on each side of the wrinkles; when cut, light brown, white near sapwood; measurement of bark, $\frac{3}{8}$ in. thick on a tree with a barrel diameter of 1 ft. 9 in. Sapwood white. Branchlets, leaves, and inflorescence hairless. Leaf stalks, $\frac{3}{8}$ to $\frac{3}{4}$ in. long. Leaves alternate, egg-shaped or elliptical in outline, mostly protracted into a short blunt point at the apex, lateral nerves and net veins visible on both surfaces; measurement of leaf blade 3 to 4 in. long, two to three times as long as broad. Flowers in bunches (panicles consisting of racemes) at the ends of branchlets; the bunches, which are about as long as they are broad, are often about as long as the leaves. Stalklets of flowers about 1/16 in. long. Flowers about $\frac{1}{3}$ in. diameter when expanded; the lowermost part, the calyx, funnel-shaped, about $\frac{1}{8}$ in. diameter, with five minute triangular lobes at the rim. Above the calyx are the five petals, each over $\frac{1}{8}$ in. long. Alternating with the petals and shorter than them are five stamens. The ovary, in centre of flower, is surmounted by a finely three to five furrowed style nearly $\frac{1}{8}$ in. long. Fruiting capsule nearly $\frac{1}{8}$ in. diameter, three to five celled, with several seeds in each cell, the five persistent calyx teeth forming a rim near the top, and the five styles separating from the base to near the summit and persistent on the capsule at its top. Seeds brown, less than 1/16 in. long.

Flowering period.—October and November; in fruit in December and January.

Distribution.—Confined to Australia. Common in the scrubs of the higher altitudes of Macpherson Range, National Park, ranges near Killarney, and Mistake Mountains, New South Wales, from near the Victorian border on the south to the Tweed River on the north; common in the scrub of the gorges of the Blue Mountains.

Uses.—Very little appears to be known about the commercial value of the timber.

Remarks.—It is a remarkable fact that this tree generally begins life on the trunks of tree ferns, where the seed germinates and the young trees develop.

References.—*Quintinia Sieberi*, A. de Candolle: Monog. Camp. 90; Bentham: "Flora Australiensis," vol. II., p. 438; F. M. Bailey: "Queensland Flora," Part II., p. 531; J. H. Maiden: "Forest Flora of N.S.W." vol. VI., p. 28, with figure.

LONG-LIVED BRITISH ENGINES.

Many examples have come to light of British engines which have been at work from the very earliest days of steam engineering. The Science Museum in London has recently placed among its exhibits a pumping engine made in the year 1791, by Newcomon. This engine was at work until the year 1915 at a colliery near Derby. Another engine, which was made in the early part of the nineteenth century, has also been presented to the Museum. Both engines are still capable of doing useful work, although they represent pioneer types very different from the British steam engines of to-day.

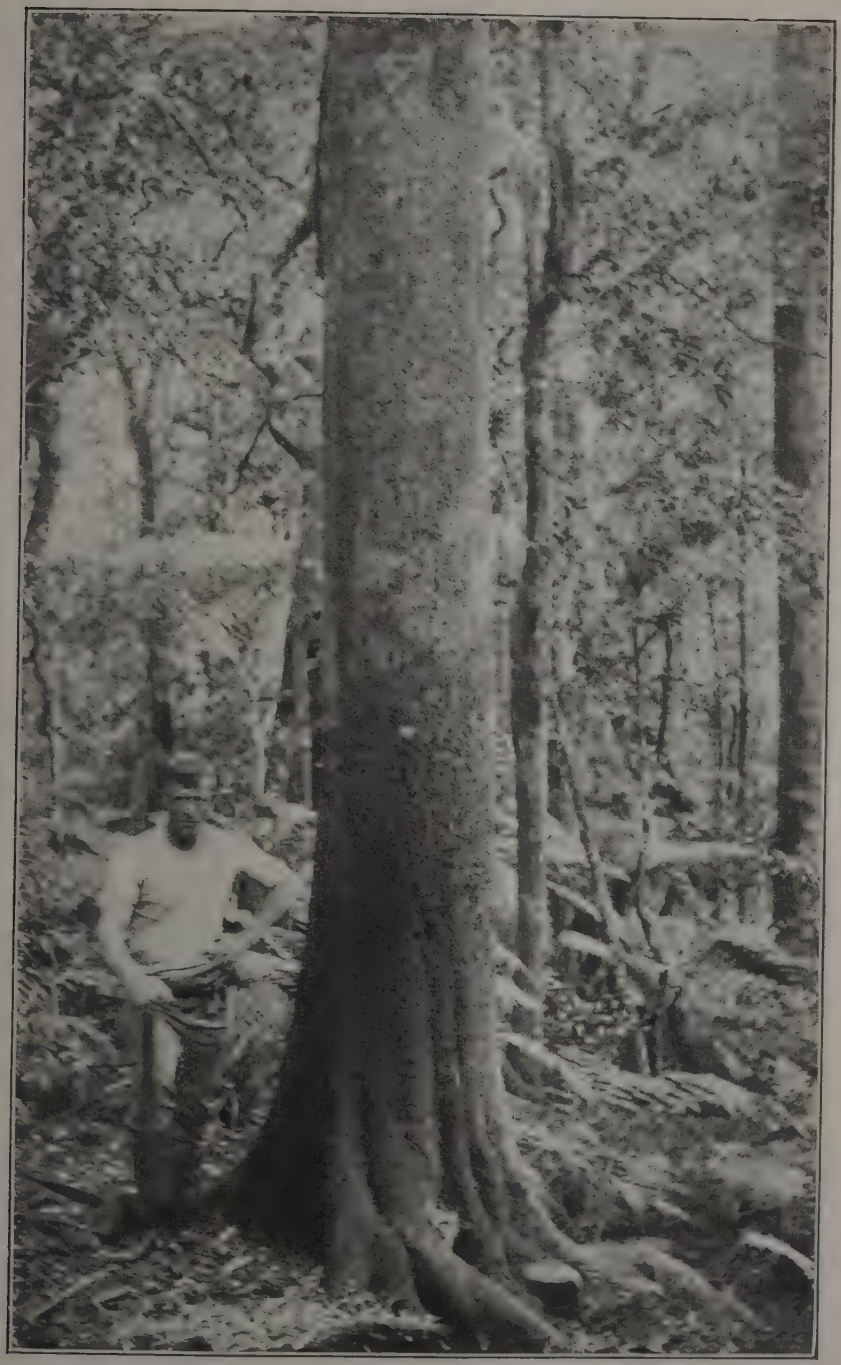


Photo by the Authors.]

PLATE 26.—OPOSSUM WOOD (*Quiuinia Sieberi*), Ranges eastward of Emu Vale, Killarney District.

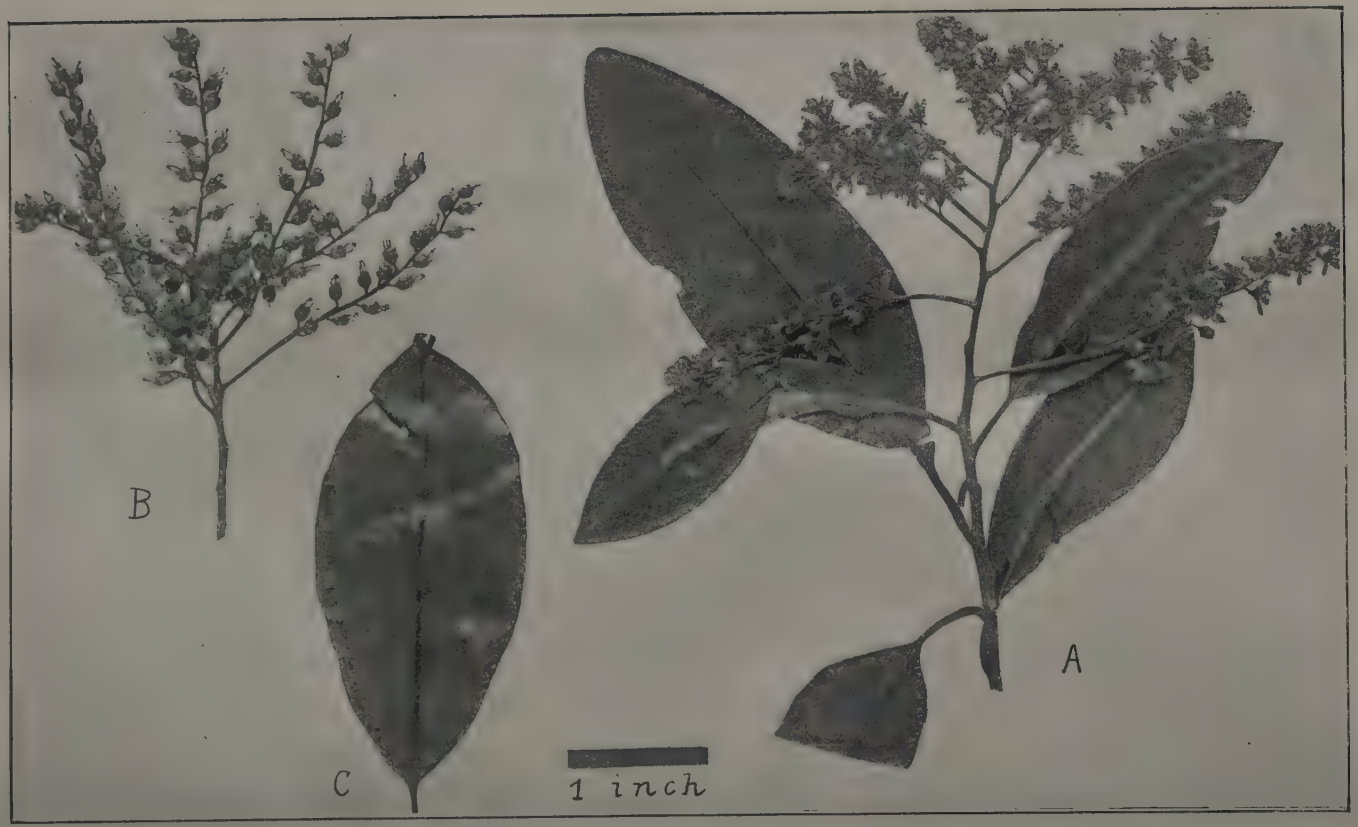


PLATE 27.—OPOSSUM WOOD (*Quintinia Sieberi*).

A.—Flowering branchlet. B.—Fruiting branchlet. C.—Leaf, showing underside.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, DECEMBER, 1921.

The weather for the month was very unfavourable for egg-production. The first three weeks were intensely hot, and during the last week 7 in. of rain fell. The outstanding feature of the month's laying was the splendid score of 170 eggs by T. Fanning's pen of White Leghorns. Broodiness has again been troublesome, but not the same extent as in November. There are odd cases of moulting, most of which are birds which have just left the broody coop. The health of the birds has been excellent. Green feed during the early part of the month was very scarce, but the excellent rains should account for a plentiful supply for the rest of the test. The following are the individual scores:—

Competitors.	Breed.	Dec.	Total.
LIGHT BREEDS.			
*J. M. Manson	White Leghorns	141	1,195
*W. and G. W. Hindes	Do.	141	1,185
*Mrs. R. Hodges	Do.	145	1,149
R. Gill	Do.	114	1,142
*T. Fanning	Do.	170	1,131
*H. Fraser	Do.	139	1,115
*Geo. Trapp	Do.	108	1,090
F. Birchall	Do.	113	1,068
*C. M. Pickering	Do.	127	1,074
Oakleigh Poultry Farm	Do.	119	1,054
H. C. Thomas	Do.	95	1,043
*H. C. Towers	Do.	84	1,034
*W. Becker	Do.	123	1,032
R. C. Cole	Do.	117	1,022
*Thos. Eyre	Do.	136	1,017
*R. C. J. Turner	Do.	137	1,016
W. A. Wilson	Do.	110	1,010
*J. W. Newton	Do.	126	1,010
*Thos. Taylor	Do.	136	1,001
*C. Goos	Do.	93	987
Mrs. E. White	Do.	103	979
*E. Chester	Do.	129	976
*S. L. Grenier	Do.	107	975
M. F. Newberry	Do.	107	970
*E. A. Smith	Do.	117	968
Bathurst Poultry Farm	Do.	102	964
*G. W. Williams	Do.	117	959
*Mrs. L. F. Anderson	Do.	117	956
*B. Chester	Do.	117	955
*J. W. Short	Do.	118	954
W. Barron	Do.	98	951
H. Stacey	Do.	93	939
*Haden Poultry Farm	Do.	117	921
C. A. Goos	Do.	110	916
*H. P. Clark	Do.	125	908
Mrs. E. Z. Cutcliffe	Do.	92	888
E. Stephenson	Do.	97	870
*W. and G. W. Hindes	Brown Leghorns	74	841
Linquenda Poultry Farm	White Leghorns	106	854
W. M. Glover	Do.	96	829
Brampton Poultry Farm	Do.	105	822

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Dec.	Total.
HEAVY BREEDS.			
T. Fanning	Black Orpingtons ...	110	1,190
*R. Burns	Do.	138	1,156
*A. E. Walters	Do.	120	1,118
*T. Hindley	Do.	127	1,118
W. Becker	Langshans	127	1,115
*Parisian Poultry Farm	Black Orpingtons ...	130	1,086
*Jas. Ferguson	Chinese Langshans ...	110	1,083
*C. C. Dennis	Black Orpingtons ...	124	1,067
Rev. A. McAllister	Do.	77	1,052
Jas. Ryan	Rhode Island Reds ...	108	1,044
Geo. Muir	Black Orpingtons ...	106	1,039
*E. Morris	Do.	121	1,036
*E. F. Dennis	Do.	119	1,013
Jas. Potter	Do.	86	998
Jas. Every	Langshans	84	990
*J. Cornwell	Black Orpingtons ...	108	987
*N. A. Singer	Do.	128	976
*R. Holmes	Do.	98	920
*J. E. Smith	Do.	112	916
*A. Shanks	Do.	109	910
*E. Stephenson	Do.	85	907
*H. C. Chaille	Do.	121	900
G. Cummings	Do.	87	897
*Mrs. G. Kettle	Do.	101	885
*E. Oakes	Do.	132	882
J. W. Newton	Do.	92	864
F. Harrington	Rhode Island Reds ...	110	816
F. C. Hart	Black Orpingtons ...	106	756
Total	...	7,800	68,491

* Indicates that the pen is being single tested.

DETAILS OF SINGLE TEST PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
J. M. Manson	188	202	220	190	224	171	1,195
W. and G. W. Hindes (W.L.) ..	209	183	193	213	207	180	1,185
Mrs. R. Hodge	190	194	211	197	202	155	1,149
T. Fanning	205	182	203	176	179	186	1,131
H. Fraser	217	160	195	189	188	166	1,115
Geo. Trapp	195	166	187	175	196	171	1,090
C. M. Pickering	198	181	180	162	195	158	1,074
H. C. Towers	184	160	174	144	168	204	1,034
W. Becker	190	194	162	161	191	134	1,032
Thos. Eyre	179	167	134	181	185	171	1,017
R. C. J. Turner	174	161	166	158	175	182	1,016
J. W. Newton	170	189	195	174	121	161	1,010
Thos. Taylor	167	171	163	142	156	202	1,001
Chris. Goos	175	180	142	124	149	217	987
E. Chester	183	162	152	160	156	163	976
S. L. Grenier	159	189	136	168	165	158	975
E. A. Smith	197	157	175	162	156	121	968
G. Williams	217	174	133	137	154	144	959
Mrs. L. Anderson	167	171	155	152	167	144	956
B. Chester	135	163	186	157	168	146	955
Haden Poultry Farm	106	152	168	169	158	168	921
H. P. Clarke	198	123	158	125	164	140	908
W. and G. W. Hindes (B.L.) ..	120	145	122	116	138	200	841

DETAILS OF SINGLE TEST PENS—*continued*.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	141	177	234	179	200	225	1,156
A. E. Walters	211	197	177	184	169	180	1,118
T. Hindley	197	196	200	153	178	194	1,118
Parisian Poultry Farm	193	179	176	234	127	177	1,086
J. Ferguson	175	167	167	208	179	187	1,083
C. C. Dennis	179	163	164	197	185	179	1,067
E. Morris	195	179	127	193	171	171	1,036
E. F. Dennis	159	185	165	159	165	180	1,013
J. Cornwell	157	161	164	181	148	176	987
N. A. Singer	171	149	160	163	144	189	976
E. Stephenson	181	147	156	161	112	150	907
R. Holmes	129	162	161	164	178	126	920
J. E. Smith	197	212	142	114	129	122	916
A. Shanks	124	150	155	162	149	170	910
H. C. Chaille	110	165	157	185	155	128	900
Mrs. G. Kettle	144	174	192	95	132	148	885
E. Oakes	135	153	154	174	131	135	882

CUTHBERT POTTS,
Principal.

CHICKEN POX.

By J. BEARD, Poultry Instructor.

Chicken-pox is due to an ultra-microscopic germ, the nature of which is not known. This disease affects chickens, pigeons, canaries, and turkeys. Geese, ducks, and guinea fowls are immune. Turkeys are very liable to contract it; as for fowls, their resistance generally varies inversely with the age of the bird.

The death rate from the disease among chickens from two to three weeks old is very often 100 per cent., whilst with chickens two to four months old it is sometimes nil. Birds of pure breed are less resistant than their crosses. Minoreas and leghorns are the most susceptible.

The infection can either be mild or severe, depending on the number, size, and seat of the nodules. At times the nodules are not any larger than a sorghum seed, and fall off without any treatment, the infection disappearing in about six weeks without affecting the general health of the birds. In severe cases the nodules are very large in size, inflammation sets in through scratching, and the nodules become tumour-like in appearance. When the eyelids and angle of the mandibles are affected, the beak remains open, the bird being unable to close it. The inflammation soon reaches the mouth, which is covered by a thick false membrane. The birds, being thus blind and unable to pick their food, soon become anaemic and emaciated, and die of starvation or are poisoned by other germs which infect the nodules and the mucus lining of the mouth. This disease prevails all the year round, but is more intense at the beginning of the summer, the death-rate being heavy from November to February.

It is said that chicken-pox is highly contagious, though the causes of infection have never been clearly defined. It is noticed that the disease prevails in an epizootic state during the dry season, *i.e.*, from November to February, and is more or less sporadic during the other months of the year. It has been said that dust is the medium of infection and that the disease is transmitted from bird to bird. This theory does not hold good, however, when one considers that the disease prevails all the year round, and that it may appear suddenly in localities where it was unknown before. It is evident, therefore, that the infection is carried through some other channel.

From observations made, I am of opinion that the infection is transmitted directly from one bird to another in exceptional cases only, but is more usually conveyed by a vector, which may be the mosquito or any night-biting insects, such as bugs, or sand-flies. To prevent the disease from spreading, the affected birds should be segregated.

Treatment.—Apart from the serum, which has not yet proved of much value, there is no specific remedy known against chicken-pox. The best-known remedies have never given any good results, except in mild cases, which, no doubt, have recovered more quickly without treatment. Cauterisation by means of metallic salts generally increases the inflammation, and should only be used in special cases—for example, when mouth and eyes are to be dressed. My experience has shown that the less one interferes with the sickness the quicker is the recovery. The removal of the crust or scab with a view of obtaining a rapid cure complicates matters, since the sores which are protected by their crust are thus exposed to further infection. It may, however, be necessary at times to apply treatment in order to avoid ophthalmia or to prevent the false membranes from invading the mouth.

The false membranes arise from the nodules existing on the margin of the beak and at the junction of the mandibles. In such cases the crust, which must be previously softened with a lukewarm solution of boric acid, is removed and the sore painted with iodine. The false membrane of the mouth can be detached by means of a swab and the front painted with iodine and glycerine or with some specific containing tannic acid.

During the attack add magnesia to the drinking water, and supply twice a week epsom salts to the morning mash at the rate of one packet to twelve adult fowls. Avoid feeding meat, maize, or any other starch-containing foods in any form.

SUGAR: FIELD REPORTS.

Mr. J. C. Murray, Southern Field Assistant, reports under date 6th January, 1922, as follows:—

In the course of the month of December the districts of Maryborough, Pialba, Yerra, Mount Bauple, and Childers were inspected.

Maryborough.—The crushing season just ended at Maryborough has been a satisfactory one. Good average tonnages were obtained, while, generally, the c.c.s. values were satisfactory. More cane has been planted than has been the case for some years, and the prospects of a good yield next year look bright. The young plant crop is very forward, while ratoons are stooling vigorously.

The farmers on Tinana Creek have considerably developed their holdings this year. Big timber and its clearing are the chief obstacles met with in the initial stages of preparation on Tinana Creek, but in the course of time the farmers hope to make their soil entirely fit for intensive cultivation. Farmers could profitably turn their attention more to adding texture to the soil by the use of vegetable manures, and endeavouring to ascertain, by local experiment, the value of concentrated fertilisers. In practically all cases, stable manures cannot be too highly recommended. Observation of different canes, with a view to obtaining a good early maturing variety, is recommended to growers, as this season many of the canes had to be cut while immature. In this respect H.Q. 285 is a cane which should give satisfactory results.

Pialba.—The growers have had good returns this year. Much of the land is still badly in need of added matter calculated to improve the texture and reduce soil acidity, but, nevertheless, farming is reaching a higher standard. The 1922 crop should be a good one. Plant cane is growing well, while most of the ratoons present a satisfactory appearance. In some places stools are diseased and have refused to ratoon, and it is recommended as a precautionary measure that stools be ploughed out next year and carted off the field. In cases like this there is the probable danger of a gradual infection of healthy cane; therefore it is well to act before this happens.

D. 1135, N.G. 16, M. 187, M. 1900 Seedling, Q. 813, and Rappoe are canes that are now making a good showing. The introduction of larger areas of 1900 Seedling and Queensland 813 would probably give the farmers more satisfactory tonnages than hitherto.

Yerra.—The farmers are still busy clearing new scrub land and farming their already-improved holdings. Their need for good roads is urgent. As the result of having to cut, in some cases, too early, there was considerable loss on some of the Yerra crops, particularly on the D. 1135 and 1900 Seedling. If possible, the latter variety at least should never be cut before the 20th September; otherwise there is a loss, both in c.c.s. and subsequent shy ratooning of the cane.

Among the varieties growing and making favourable progress are M. 16804, E.K. 1, H. 22, Q. 813, Shahjahanpur, H.Q. 77, E.K. 28, H.Q. 77, H. 146, J. 147, N.G. 81, Q. 970, E.K. 2, and H.Q. 285. Most of these have only been recently introduced, but are promising canes, particularly the Q. 813, which the farmers are highly recomemnded to plant.

Mount Bauple.—Canegrowing is being vigorously carried on. It is quite a fallacy to suppose that this district is unsuited for sugar production. On the contrary, given fair average weather conditions, the farmers here can rely upon getting as high c.c.s. values and tonnages as anywhere south of the tropics. A good deal of attention is being given by the growers to fertilisation. This is an important matter at Mount Bauple, and the growers are recommended to make full use of the facilities provided by the Bureau for obtaining information on this matter.

Good work is being done by Mr. Holloway, head teacher at the school, in connection with encouraging the children to take an interest in cane culture, and with this end in view he has a small plot established, and he hopes later to give some information as to results. Q. 813 is making remarkable growth, and the farmers in the course of time will probably be growing this cane as a staple variety.

Stools in places are affected, and the precautionary measure of ploughing out old stools would be a good one. Liming on old soils would also be very beneficial. Good results have been obtained by filterpress cake on some Bauple soils, but the use of green manures and lime would be cheaper and much more efficient.

Cane pests are, fortunately, not serious just now, and this is due in a measure, especially with regard to the borer, to care in planting and the destruction of cane that might have deteriorated into rubbish in the vicinity of healthy cane.

Childers.—Childers at present presents the appearance of a large and well-tended landscape garden. The farms are marvellously green, and much cultivation has been done by growers. The majority of the farmers are up to date in their equipment. Fertilising on a fairly large scale is now being undertaken. Farmers are strongly advised to be cautious before indiscriminately applying chemical fertiliser. Ample facilities are at hand whereby they can get soil and fertilisers tested, and so save, perhaps, time and money. Advice on all methods of manurial experiment can be obtained from the Bureau.

Regarding cane varieties, 1900 Seedling and D. 1135 appear to be, so far, the best of the staple varieties, although there are some very fine crops of Q. 813 growing. Regarding the two first-mentioned canes, there was considerable loss in c.c.s. value this year through cutting too early, and growers are recommended to plant these canes in conjunction with H.Q. 283, which is a good cropper and an early maturing variety. A small area of H.Q. 285 brought from the Maroochy River is already doing well as a young plant crop. Up the line, at Booyal, the farmers are once again taking up canegrowing seriously. There are some very fine areas showing at present, especially D. 113. As many as forty-eight sticks of plant cane of this variety were counted on one stool. Other canes doing well at Booyal are M. 1900, Striped Singapore, Rappoe, E.K. 28, E.K. 1, J. 247, and Shahjahanpur. The three lastnamed, recently distributed from Bundaberg Experiment Station, are looking very promising. About 2,000 tons of cane were sent from Booyal this season, and by appearances this tonnage should be increased 50 per cent. next season.

There is a great deal of fine sugar land still to be cleared on this Upper Burnett country; in fact, there is sufficient to support another sugar-mill.

Mr. E. H. Osborn, the Northern Field Assistant, reports under date 11th January, 1922, as follows:—

Gordonvale.—Early in the month of December a short visit was paid to this district. Conditions at the time were very dry. The mill was very busily crushing and preparing for extensive alterations and additions necessary to cope with the extra tonnage of cane entailed by the redistribution of areas in connection with next season's crop.

A flying visit was made to the Riverstone area. Mr. George Alley (of Blackwell and Alley) advised in connection with their harvesting that a 5-acre block of river flat Plant Badila had cut at the rate of 37 to 38 tons per acre. As this particular block is probably the oldest cane land in the Mulgrave area, having previously grown cane for the old Pyramid Mill some thirty-five years or so ago, and having been practically under cane ever since, its fertility is remarkable. Lately Mr. Alley has used about 4 cwt. of mixed fertiliser on plant cane, and about half of that quantity of sulphate of ammonia upon ratoons.

Further up the river several new farmers were noticed growing cane on portions of the old Pyramid plantation.

A very large number of greyback beetles was noticed in the weeping figs and other feeding trees in the area, some being even found in the mosquito curtains of the hotel. These were evidently attracted by the gaslight.

Babinda.—Dry weather prevailed in this region until the 11th, when some very welcome showers fell. Milling operations for 1921 had ceased, and the cane harvested amounted to 117,321 tons, equalling a return of 18.1 tons per acre. Of this tonnage, about 90 per cent. was Badila, the remainder being mainly D. 1135 and H.Q. 426. The acreage cut was 6,472, and a further 549 acres were allowed to stand over. Burnt cane, in the proportion of 45 per cent., was cut. Next season some 7,000 acres should be harvested.

During the crushing period no strikes or industrial troubles of any kind caused delay, and the early finishing up will give the growers a good chance to thoroughly work their farms. Early plant and also the earlier-cut ratoons have not made the growth expected in this area. The later-planted cane, and also the ratoons cut later on in the season, are, however, looking pretty well.

Some splendid plant and also ratoon Badila were seen upon Mr. P. Larsen's Bartle Frere holding. Both on his river flat and red soil very fine growth was noticed, and the cane looked remarkably green and healthy.

Around Mopo some very good crops of plant cane were seen. They were all very clean, good coloured, and strong in growth. Very few beetles have been seen so far this year in the Babinda area.

South Johnstone.—This district was revisited during the third week in December. Weather conditions were dry, no rain of any consequence having fallen for about a month. Later, however, after a couple of preliminary showers, heavy falls occurred, making the total for the month to date (28th December) of 18.71 in., 17.96 in. of which fell since the 19th. At time of writing the cane everywhere looks splendidly green and vigorous. After such heat, the growth is naturally forced, and the rich volcanic and alluvial soils respond very readily. On the red soil the cane looks extremely well. Many pony ploughs are being used among the stumps with very good results.

Around the Kalbo country the work of getting the cane from the low-lying alluvial flats up to the branch line leading to the main locomotive line at Kalbo Junction is distinctly arduous, comprising, as it does, the haulage of the cane up a very steep ridge, 12 chains in length, by means of a wire rope attached to a donkey engine supplied by the South Johnstone Central Mill.

CANE PESTS CONTROL.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (13th January, 1922) from the Entomologist at Gordonvale, Mr. Edmund Jarvis:—

"During the past month the time has been very fully occupied in experimentation affecting the adult form of our 'grey-back' cane beetle. Unfortunately, this important phase of its life-cycle occupied only a couple of months—viz., during the flighting period—whereas the grub stage admits of investigation during about six months of the year.

"The wet season set in here on the evening of 19th December, and by midday on the 21st 7.18 in. of rain had fallen at Meringa, thus putting a stop, for the time being, to field experiments and fumigation of the soil with carbon bisulphide.

"*Experiments with Deterrents.*

"Our plots at Carrah were treated between 12th November and 8th December in order to allow for beetles emerging at the beginning of November, and for a second emergence on the 18th of that month. The various insecticidal substances used with a view to inducing beetles to avoid the treated areas were coal-tar, naphthalene, chloride of lime, tobacco dust, and carbolineum emulsion, each plot being one-eighth of an acre and separated by a control plot.

"To avoid labour involved in emulsifying and spraying the tar, it was prepared by mixing the quantity needed—viz., 2 gallons (= 16 gallons per acre)—with five kerosene tins full of sifted soil, so that it could be easily sprinkled, either by hand or machine, on each side of and between the stools of cane, in a strip about 3 ft. wide. When examined twelve days later (0.15 in. of rain having fallen during the interval) the tarry odour was quite pronounced, and even after twenty-six days it was still perceptible, although not sufficiently so to be repellent. The chloride of lime, which was also mixed with soil and applied at the rate of 160 lb. to the acre, maintained its odour for nearly a week, but lost it about nine days after. The naphthaline was administered at the rate of 120 lb. per acre, and retained its repellent properties longer than the lime; while the carbolineum emulsion did not keep its odour beyond a few days. Tobacco dust, applied at the rate of 96 lb., retained its odour for some days after application. It will be interesting to note later on whether any of these repellents have induced egg-laden female beetles to oviposit elsewhere.

"Poisoning the Adult Beetle.

"As mentioned last month, five sets of experiments have been conducted this season, comprising eighty-nine cages containing leaves sprayed with various arsenical solutions.

"The results obtained, although not altogether conclusive, were sufficiently encouraging to warrant further experimentation along similar lines next year. One point of importance observed was the fact that beetles to be experimented with should be captured directly they emerge, and before they start feeding.

"After being four or five days on the trees, they cease feeding and practically eat little or nothing during the remainder of their aerial existence. For instance, out of fifteen beetles collected on 2nd December (nine days after emergence) about 50 per cent. did not live more than a week; and during the course of this experiment only one beetle out of this number touched the fresh figleaves placed in its cage.

"Those used for the first experiment were captured on 5th November, about four days after emerging from the soil, but even then the majority had ceased feeding, as only eight out of the thirty touched the leaves placed in the cages. The first beetles to die were those that had eaten portions of the poisoned leaves.

"Paris green 1 lb., lime 1½ lb., in 8 gall of water, proved fatal from four to seven days after feeding; while arsenate of lead took nine days. About 50 per cent. of these beetles died just a fortnight after capture, the last succumbing after twenty-four days. The beetles that lived longest (from sixteen to twenty-four days) were those that took no food whatever. The specimens that fed were four control beetles, and a similar number from treated cages.

"In an experiment conducted on 22nd November, it was found that confined specimens of albohirtum would feed indifferently either on Moreton Bay Ash (*Eucalyptus tessalaris*) or the 'tar' tree (*Semecarpus australiensis*) when leaves of both species were placed together in the cages. I have previously mentioned that this cane-beetle does not, like some insects, exhibit a keen sense of discrimination in the choice of food, but, on the contrary, appears indifferent as to its flavour, being as ready to devour leaves sprayed with poisons as untreated foliage.

"Parasite of Moth-Borer.

"It will be of interest to mention that success has attended our efforts to breed and propagate the Braconid wasp, which, as mentioned in last month's report, is an insect enemy of the moth-borer of cane in New South Wales, where it is credited by Oliff with being a parasite of great economic importance.

"I am of opinion that the control of our large moth-borer (*Phragmatiphila truncata* Walk.) in the Cairns district is due mainly to the activities of this tiny wasp.

"The specimens bred by us this month from ratoons collected at Banna were confined in suitable cages with borer-caterpillars on 5th December, and having parasitised them, produced broods of wasps three weeks later (25th December). In view of the fact that each of these parasites is able to lay nearly a hundred eggs (our highest record here at present being 93), and, moreover, has a life-cycle of only three weeks, it is not surprising that moth-borer attack should be confined here to a few localities where it is seldom noticed except early in the season, and never assumes serious proportions. The parasite in question (*Apantelcs nonagriæ* Oliff) is a minute black wasp, no bigger than a sandfly, and having threadlike antennæ, which in the male are much longer than the body, but a little shorter in the opposite sex. The female punctures the caterpillar by means of a special piercing instrument or ovipositor, and deposits eggs inside it, which in due course produce maggots that start at once to feed on the internal tissues. This larval stage occupies about fourteen days, after which the maggots leave the body of their host, and, remaining together, spin white, egg-like silken cocoons, which are usually concealed behind some dead leaf-sheath, but sometimes are located inside the tunnel of the bored ratoon.

"These cocoons, which occur side by side in a flattened mass, and are about three-sixteenths of an inch long, with rounded ends, finally develop a few days later into wasps.

"We hope to introduce this useful parasite as soon as possible into the Ayr district, where this year the moth-borer has occasioned serious losses in certain cane areas on Rita Island and elsewhere.

"Beetle Borer Parasite.

"Bred specimens of the tachinid fly-parasite of *Rhabdocnemis obscuris* Boisd., the well-known beetle-borer of cane, continue to emerge freely in our insectary from cane sticks artificially stocked with beetle grubs during November.

"Numbers of these parasites have been liberated this month (December) on plantations at Riverstone, and on land subject to borer on the banks of the Mulgrave River at Gordonvale. Several letters have been received from the Innisfail and Babinda districts, asking for tachinid flies, so, in order that all requests may be met, we intend to continue the breeding of this insect during January and February.

"Beetles as Food.

"A sample of beetle-meal prepared from our grey-back cockchafer has been submitted this month for analysis, and may prove to be a valuable food for poultry. The Curator of the Zoological Gardens in Sydney has tried for some years past to obtain meal of this nature for feeding insectivorous birds, and is prepared to offer a good price if the analysis should prove favourable. In the present instance the beetles collected were killed with hot water and dried at once in a simple home-made oven of galvanized iron. The bodies were then reduced to meal by being passed through an ordinary corn-crusher.

"It might be of interest to mention that a manure is prepared from bodies of the European cockchafer. Guenaux states that this 'is equal to that of the best manure as regards phosphoric acid and potash, and is eight times richer in nitrogen. One hundred pounds of beetles are, therefore,' he remarks, 'equal to 800 lb. of manure.' In view of this statement it seems probable that the 22 tons of beetles collected one year in the Cairns district might have been turned to very profitable account. In the event of collecting being again taken up here, it would be advisable to look into this matter of the manurial value of our cane-beetle, and, if possible, defray in this way part of the expense of collecting."

FOREIGN INGREDIENTS IN AGRICULTURAL SEEDS.

By F. F. COLEMAN, Expert under the Pure Seeds Acts.

Every purchaser should know the purity and germination of the seed that he intends to sow; also its freedom from diseased or insect-infested seeds. These matters can only be decided by a thorough examination of a large and truly representative sample. Seeds constitute the most variable material that the farmer or merchant purchases, and the success or failure of a crop, or even succeeding crops, may be wholly determined by the kind or condition of the seed sown. No one can afford to leave any doubtful point to chance, and it is but common prudence to ascertain the *purity* and *germination* of all seeds purchased, before sowing or offering them for re-sale.

Analysis and Method of Sampling.

Samples of any seeds purchased or offered for sale as seed for sowing, may be sent to the Department of Agriculture for analysis. All samples must be drawn from the actual bulk in the sender's possession, and care should be taken to obtain a small quantity from each bag, carefully mixing the portions so obtained, in order to make the sample truly representative of the bulk.

Marking of Samples.

All samples sent for analysis must have the following particulars plainly written thereon:—

Name of seed;

Quantity the sample represents, and marks, if any;

Name and full address of sender.

Example:—

Seed for analysis, representing 30 bags Japanese millet,

Ex A. Smith, Farmer, Westgate.

From T. Brown, Produce Merchant, Exmouth.

Samples should be addressed as follows:—

Seed for Analysis,

The Under Secretary,

Department of Agriculture and Stock,

Brisbane.

WEIGHT OF SAMPLES.

All samples of seed sent for analysis must not be less than the weights herein set out, and in the case of seeds containing a large amount of foreign ingredients *double* the weight mentioned should be sent.

Wheat, Oats, Barley, Maize, Rice, Rye, Cowpeas, Tares, Peas, Beans ..	8 oz.
Lucerne, Sweet Clover, Sorghum, *Sorghum sudanense* (Sudan grass), Panicum, Millet, Linseed, Canary, Prairie Grass, Buckwheat, Cotton	4 oz.
Rhodes grass, *Paspalum dilatatum*, Rye grass, Cocksfoot, Couch grass ..	2 oz.
All agricultural seeds other than those included above	2 oz.

FREE ANALYSIS FOR FARMERS.

No charge is made to farmers sending in samples of any seeds purchased by them for their own sowing, providing the following particulars are plainly written on each sample sent:—

Vendor's name and address.
Name of seed.
Quantity purchased.
Date of delivery.
Locality where seed is to be sown.
Name and address of purchaser.

VENDORS' FEE FOR ANALYSIS.

A fee of 2s. 6d. per sample will be charged for all samples sent by vendors for purposes of analysis. A vendor within the meaning of the Pure Seeds Acts is:—

> "Any person who sells, or offers or exposes for sale, or contracts or agrees to sell or deliver any seeds."

It will, therefore, be noted that the common acceptance of the Acts as referring only to seedsmen is erroneous. A Produce Merchant, Storekeeper, Auctioneer, Farmer, or grower of the seed are vendors under the Acts whenever they sell, offer, expose for sale, contract or agree to sell any seeds for sowing.

THE PURE SEEDS ACTS.

All vendors of seeds for sowing must comply with the Pure Seeds Acts and Regulations thereunder, copies of which may be obtained from the Government Printer, George street, Brisbane, for 1s. 7d. post free.

INVOICE MUST BE GIVEN BY VENDOR.

On the sale of any seeds of not less value than one shilling the vendor must give to the purchaser an invoice stating that the seeds are for planting or sowing, the kind or kinds of such seeds, and that they contain no greater amount of foreign ingredients than is prescribed.

The actual wording on an invoice should be—

> "The seeds mentioned on this invoice are for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed for such seeds."

FOREIGN INGREDIENTS.

Foreign ingredients include dead and non-germinable seeds, diseased or insect-infested seeds, weed seeds, or seeds of any cultivated plant other than that to which the sample purports to belong. Also inert matter, which includes chaff, dust, stones, or any material other than seeds, and broken seeds less in size than one-half of a complete seed.

The proportion or amount of foreign ingredients that may be contained in any seeds is prescribed by the Regulations.

"B" GRADE SEEDS.

Seeds in which the amount of foreign ingredients exceeds the proportion set forth in Schedule A of the Regulations, but does not exceed the proportion set forth in Schedule B, may be sold as seeds for sowing, providing they are contained in bags or packages to each of which is affixed a label, brand, or stamp, clearly and indelibly marked, specifying: The kind or kinds of such seeds; that the seeds are "B" grade, for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed; the name and address of vendor. All invoices relating to such seeds must be distinctly marked "B Grade Seeds."

QUALITY FIRST.

The best is the cheapest, whatever the price, and quality should be the one and only consideration that determines a purchase. An opinion as to the quality or condition of any agricultural seed is useless unless based on the actual facts revealed by an analysis conducted under uniform scientific methods. This work is undertaken by the seed laboratory of the Department of Agriculture. Before sending samples, care should be taken to see that they are not only drawn from, but truly representative of, the bulk, and are marked in accordance with the particulars beforementioned.

COVERING LETTER.

All samples with *covering letter*, should be addressed to—

The Under Secretary,
Department of Agriculture and Stock,
Brisbane.

THE ALL-HARVESTER MACHINE.

At a recent agricultural exhibition in Great Britain there was exhibited an attachment to a harvester which forms the first step towards eliminating all hand-labour in the harvest field, apart from the mere driving of the machine. This attachment is intended for standing the sheaves up after the harvester has cut and bound them. The judges at the exhibition thought so well of it that they awarded the makers a silver medal.

Answers to Correspondents.

RHODES GRASS.

R. F. M. (Gayndah)—

Rhodes grass has proved to be among the best for your district, and, like other fodder grasses, it responds to fair treatment. Reported failures are often due to overstocking, particularly before the grass has re-seeded and so firmly established itself. An absolute heavy stock-carrying drought-resister is hard to get.

Give Rhodes another chance.

PREPARING SAGE FOR MARKET.

E. D. (Spring Creek, Stanthorpe)—

Cut sage with sickle and dry on hessian or calico sheets.

TOBACCO-GROWING.

H. F. H. (Apsley, Winton)—

The present unsatisfactory system of marketing reduces the chances of success in tobacco-growing.

BANANA SOIL AND POTASH.

T. G. (Mount Lawson)—

The Director of Fruit Culture advises the use of a complete fertiliser suitable for bananas, described in previous issues of the Journal, and obtainable from any dealer in manures.

TO DESTROY MEAT ANTS.

F. L. W. (Birkdale)—

Pour half a cup of carbon bisulphide (any chemist) over the ants' nest. Stand off a safe distance and throw a match on to the soaked surface. A slight explosion will follow. Immediately after, cover the ant bed with a bag well saturated with water. The greatest care should be exercised in handling, keeping clothes free of, and igniting the compound, as it is highly explosive.

HAY-STACK MEASUREMENTS.

M. T. MILLS, (Christmas Creek)—

To calculate the contents of an oblong stack, multiply the length by the breadth, and the product by the total average height, and divide by 350 for old hay and 400 for new hay. This will give a rough idea of the contents, in tons. To find the total average height, add the height from the ground to the eaves to half the height from the eaves to the ridge.

Example.—

D to *E* = 12 ft.; ½ of *E* to *F* = 5 ft.; 12 + 5 = 17 = total average height.

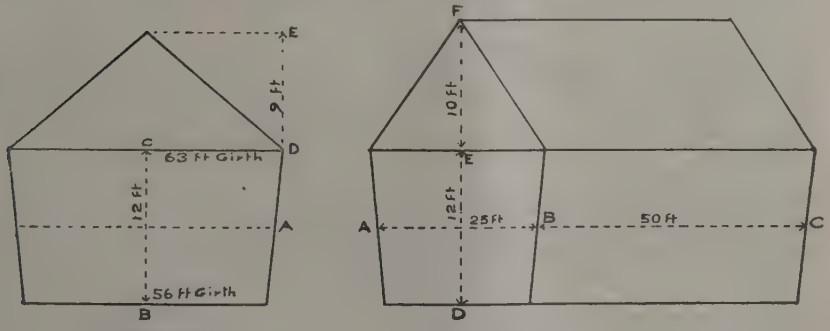
A to *B* = breadth=25 ft. *B* to *C* = length = 50 ft.

50 × 25 × 17 = 21,250 = total contents of stack in cubic feet.

21250 ÷ 400 = 53⅛ tons.

To calculate the contents of a round stack, take the girth at the bottom of the stack and add this to the girth at the eaves; half the sum is the mean girth. Square the mean girth, and multiply by 7/88, which will give the area of the base. Multiply this by the height, and this will give the contents, in cubic feet, of the bottom part of the stack.

To find the contents of the top portion of the stack, square the top girth and multiply by 7/88, by one-third of the height.



Example.—

Bottom Portion: Bottom girth, 56 ft. Top girth, 63 ft. 63 + 56 = 119 ÷ 2 = 59½ ft.

A to *A* = 59½ ft. = mean girth.

B to *C* = 12 ft. = height from ground to eaves.

59½ × 59½ × $\frac{7}{88}$ × 12 = 3,379 cub. ft. = contents of bottom portion of stack.

Top Portion: *D* to *E* = 9 ft. = height from eaves to top of roof. 9 ÷ 3 = 3.

63 × 63 × $\frac{7}{88}$ × 3 = 935.7 cub. ft. = contents of top portion of stack.

Total: 3,379 + 935.7 = 4,314.7 cub. ft. = total contents of stack.

4,314.7 ÷ 400 = 10.7 tons.

In the foregoing examples it is taken that the hay would go 400 cub. ft. to the ton. This is only approximate, as the weight per cubic foot varies considerably, according to the kind of hay, age, and other conditions. To ascertain the tonnage with any degree of certainty, it would be necessary to find the average weight of a cubic foot of the hay. This could be arrived at by cutting out cubes 1 ft. by 1 ft. by 1 ft. with a hay knife from different parts of the stack or hayshed, and weighing same.

Farm Notes for March.

Land on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that the young weeds will not make such vigorous growth during the next few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—*i.e.*, spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in all dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bag or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which were too far advanced to benefit by the recent rains, and which show no promise of returning satisfactory yields of grain, would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of sudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

Orchard Notes for March.

THE COAST DISTRICTS

As soon as the weather is favourable, all orchards, plantations, and vineyards that have been allowed to get somewhat out of hand during the rainy season should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

The cooler weather will tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become overdeveloped before it is packed, otherwise it may arrive at its destination in an overripe and, consequently, unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality should be packed. Smaller or inferior fruit should never be packed with good large fruit, but should always be packed separately.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of, plantations which are apt to become somewhat dirty during the gathering of the crop must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specky fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of the necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits, does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case recommended by the writer when he came to this country from California in 1892, and which again proved its superiority in the recent shipment of oranges from South Australia to England. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is, in the writer's opinion, the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. No matter which case is used, the fruit must be sweated for seven days before it is sent to the southern markets, in order to determine what fruit has been attacked by fruit-fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit-fly must be systematically fought in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach-moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codlin moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moths will soon be thinned out.

Strawberry planting can be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be carefully followed. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been given in the Granite Belt area in the course of the present season by Mr. Rowlands, the Tasmanian Fruit Packing Expert, whose services the Queensland Government have been fortunate in securing, and whose practical advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes, and it is pleasing to note that some growers are packing their fruit very well. Those who are not so expert cannot do better than follow the methods of the most successful packers.

Parrots are frequently very troublesome in the orchards at this time of the year, especially if there is a shortage of their natural food. So far, there is no very satisfactory method of combating them, as they are very difficult to scare, and, though shooting reduces their numbers considerably, they are so numerous that it is only a subsidiary means.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the

soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of requiring water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening state, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much water is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light irrigation is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1921.	Dec., 1920.
North Coast.	In.		In.	In.
Atherton	7·40	20	6·42	8·71
Cairns	9·14	39	10·26	8·37
Cardwell	8·34	49	13·63	4·23
Cooktown	7·07	45	7·97	6·89
Herberton	5·61	34	7·27	7·85
Ingham	7·13	29	9·55	6·26
Innisfail	12·10	40	17·72	5·31
Mossman	12·34	13	24·28	9·51
Townsville	5·53	50	5·55	1·21
Central Coast.				
Ayr	3·70	34	9·09	2·78
Bowen	4·32	50	9·70	2·19
Charters Towers ...	3·51	39	3·50	3·67
Mackay	6·76	50	13·38	2·37
Proserpine	8·28	18	19·66	2·10
St. Lawrence ...	4·22	50	18·01	0·92
South Coast.				
Biggenden	4·11	22	12·50	3·55
Bundaberg	4·43	38	15·89	10·59
Brisbane	4·97	70	11·33	2·57
Childers	4·91	26	15·45	7·90
Crohamhurst ...	Nil	Nil	Nil	3·09
Esk	4·13	34	11·85	1·66
Gayndah	3·78	50	11·11	6·98
Gympie	5·62	51	11·14	3·07
Glasshouse M'tains	6·34	13	11·67	2·77
Kilkivan	4·08	42	12·33	3·17
Maryborough ...	4·51	50	11·23	10·08

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1921	Dec., 1920.
South Coast—continued:	In.		In.	In.
Nambour	6·00	25	13·76	3·67
Nanango	3·47	39	13·11	1·28
Rockhampton ...	4·19	34	19·42	0·98
Woodford	5·19	34	12·73	2·08
Darling Downs.				
Dalby	3·12	51	9·10	2·61
Emu Vale	3·46	25	6·52	3·01
Jimbour	3·02	33	7·68	0·88
Miles	2·43	36	6·02	2·84
Stanthorpe ...	3·42	48	6·61	2·84
Toowoomba ...	4·11	49	8·07	4·10
Warwick	3·41	34	9·27	2·40
Maranoa.				
Roma	2·29	47	4·89	2·50
State Farms, &c.				
Bungeworgorai ...	2·26	7	3·81	1·63
Gatton College ...	3·26	22	Nil	2·14
Gindie	2·63	22	2·16	1·49
Hermitage ...	2·73	15	7·47	2·31
Kairi	7·66	7	5·78	6·09
Sugar Experiment Station, Mackay	7·99	24	14·50	2·04
Warren	2·88	7	10·05	1·40

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for December this year, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND,
State Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1922.	JANUARY.		FEBRUARY.		MARCH.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·0	6 51	5·24	6·46	5·45	6·25
2	5·1	6·51	5·25	6·46	5·45	6·24
3	5·1	6·51	5·26	6·45	5·46	6·23
4	5·2	6·51	5·27	6·45	5·46	6·22
5	5 3	6·52	5·28	6·44	5·47	6 20
6	5·4	6·52	5·28	6·43	5·48	6·19
7	5·4	6·52	5·29	6·42	5·49	6·18
8	5·5	6·52	5·30	6·42	5·50	6·17
9	5 6	6·52	5·31	6·41	5·50	6·16
10	5·6	6·52	5·31	6·41	5·51	6·15
11	5·7	6·52	5·32	6·40	5·51	6·14
12	5 8	6 52	5·33	6·39	5·52	3·13
13	5·9	6·52	5·34	6·38	5·52	6·12
14	5·9	6·52	5·35	6·38	5·53	6·11
15	5·10	6·52	5·35	6 37	5·53	6·9
16	5·11	6·52	5·36	6·36	5·54	6·8
17	5·12	6·52	5·37	6·35	5·54	6·7
18	5·12	6·52	5·38	6 34	5 55	6 6
19	5·13	6·52	5·38	6 34	5·55	6·5
20	5·14	6·52	5·39	6·33	5 56	6·4
21	5·15	6·51	5·39	6 32	5·56	6·3
22	5·16	6·51	5·40	6·31	5 57	6·2
23	5·17	6·51	5·40	6·31	5·57	6·1
24	5·18	6·50	5·41	6·30	5·58	5·59
25	5·19	6·50	5·41	6·29	5·58	5·58
26	5 19	6·50	5·42	6·28	5 59	5·57
27	5·20	6·49	5·43	6·27	6·0	5·56
28	5·21	6·49	5·44	6·26	6·0	5·55
29	5·22	6·48	...	...	6·1	5·54
30	5·23	6·48	...	...	6·1	5·53
31	5 ·23	6·47	...	...	6·2	5·52

PHASES OF THE MOON, ECLIPSES, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when summer time is not in force.

		H. M.
6 January	☾ First Quarter	8 24 p.m.
14 „	○ Full Moon	12 37 a.m.
20 „	☽ Last Quarter	4 0 p.m.
28 „	● New Moon	9 48 a.m.

Apogee on 3rd at 8·54 a.m.
„ on 30th at 10·24 p.m.
Perigee on 15th at 9·48 a.m.

5 February	☾ First Quarter	2 52 p.m.
12 „	○ Full Moon	11 18 a.m.
19 „	☽ Last Quarter	4 18 a.m.
27 „	● New Moon	4 48 a.m.

Perigee on 12th at 9·0 p.m.
Apogee on 27th at 12·48 a.m.

7 March	☾ First Quarter	5 22 a.m.
13 „	○ Full Moon	9 14 p.m.
20 „	☽ Last Quarter	6 43 p.m.
28 „	● New Moon	11 3 p.m.

Perigee on 13th at 9·30 a.m.
Apogee on 26th at 5·36 a.m.

The splendid phenomenon of an annular or ring-shaped eclipse of the sun will be seen, if clouds do not intervene, in North Africa (including part of the Suez Canal) and in South America on 27th and 28th March.

The only other eclipse of the year will be the Great Australian Total Eclipse of the Sun on 21st September, of which special particulars will be given.

The apparent proximity of the moon and Delta Tauri early in the evening of 9th January will be of interest to those who possess telescopes or binoculars, also the occultation of Omicron Leonis on the 16th, about 1 o'clock in the morning. On 7th February Delta Tauri will be occulted by the moon about 4 o'clock in the morning, also another small star in the same constellation half an hour later, followed by another within three quarters of an hour after that.

The occultation of Jupiter by the moon on 16th February will unfortunately occur about sunrise at Brisbane, but may be observable at Oontoo, Birdsville, and other places in the far south-west.

The planet Jupiter will be coming into view before midnight in February and March; Venus will pass from west to east of the sun on 9th February; and Mercury from east to west on the 14th. Before the end of March Jupiter and Saturn will be prominent evening stars.

On 21st March the sun will rise almost exactly due east, and set due west, passing from south to north of the equator.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.